Title of Investigation:

Simulated Satellite ("SimSat") Safety & Development

Principal Investigator:

Mr. Patrick L. Kilroy (Code 568)

Other In-house Members of Team:

Jack Vieira (Code 840), Tim Sauerwein (Code 568), Kathy Jenkins (Code 568), and Dr. John Day (Code 560)

Other External Collaborators:

Various university student interns; Mr. John Hoge (QSS) and his Venture Crew 173 Scouts; Amateur Radio experimenters and volunteers, including, but not limited to, Hugh O'Donnell and other members of the Goddard Amateur Radio Club; Chuck Jacob (Code 452); and Ben Lui (Code 870). Late in the program, a brief collaboration with the Maryland Space Grant Consortium (MDSGC) was explored.

Initiation Year:

FY 2004

Aggregate Amount of Funding Authorized in FY 2004 and Earlier Years:

$25,000; 0.9 FTE and two graduate students in FY 2004

Proposed for FY 2005:

$39,920; 1.7 FTE and two or more undergraduate or graduate students

Initially Authorized for FY 2005:

$15, 000; 0.3 FTE and one SIP student.

Additional Grant for FY 2005:

0.4 FTE, for a total of 0.7 FTE

Actual or Expected Expenditure of FY 2005 Funding:

$0; 0.7 FTE, one SIP student, one NASA Academy student, one co-op student, and two high school summer student volunteers

Status of Investigation at End of FY 2005:

Developed a local balloon-powered launch vehicle, with active recovery mechanism and procedures for experiments designed and built by future engineers and scientists. Completed one portion (program development) of two in FY 2005 with excellent results at the expense of terminating the other. The other portion (safety) was terminated to meet the level of funding authorized.

Expected Completion Date:

September 30, 2005

Purpose of Investigation:

The purpose of this investigation was to explore ways to inspire and influence higher-education students through a radically new flight project. On a shoestring budget, we had five primary goals. First, we set out to launch a small, high-altitude balloon in shared, populated airspace. Second, we wanted to explore a balloon bus, a payload, and various ground-system developments and applications. The latter included testing the feasibility of flying a standard commercial wireless or "WiFi" unit as an S-band transponder that would serve as a temporary flight communications link that united the students and their schools. Third, we wanted to produce safety analysis, range-safety products, and environmental preservation documentation. Fourth, we hoped to identify concomitant products required to take a future launch on the road and to develop ground crew training, And fifth, we wanted to continue to explore new partnerships with universities, scouting groups, and other community groups to teach satellite technology by guiding the students while they designed, built, tested and flew simple payloads—in other words, involving students in every aspect of their own simulated NASA space mission.

Figure 1. Bob Bruninga of the U.S. Naval Academy demonstrates his flight hardware at the popular May 13 HASBE symposium.

Accomplishments to Date:

The publications and procedures produced under this DDF were earmarked to contribute to a future project infrastructure. A number of presentations in PowerPoint format were produced for the High-Altitude Small Balloon Experimenter's (HASBE) Symposium in May 2005. The symposium (see photo in Figure 1) successfully united two diverse groups of explorers and employed five intern students who gained valuable experience completing technical tasks. Interfacing with the range safety officer at Wallops was fruitful. By supporting a Maryland Space Grant Consortium balloon mission late in the summer (see photo in Figure 2), they saw their payload recovery success rate leap forward. We received favorable press coverage in *The Goddard View,* Volume 1, Issue 7, October 2005.

Figure 2. Students perform final payload preps for balloon release on September 24.

Key Points Summary:

Project's innovative features: As a low-cost flight project, this project offered hands-on technical training for future space flight mission managers and high visibility to the public. It also encouraged collaboration among outside collaborators and inter-directorate personnel.

Potential payoff to Goddard/NASA: The project offered increased potential to enhance the aerospace workforce with the best engineers, scientists, and technicians imaginable. It also offered NASA an opportunity to reach out into the community and generate goodwill.

The criteria for success: The criteria for success included: Initiating an infrastructure for a new flight project, with a goal to one day institutionalize it at Goddard; Employing higher-education students for SimSat mission development; Fusing key players in Maryland to establish a local balloon group; Tracking student progress through their academic years; Performing safety analysis on certain flight or ground phases.

Technical risk factors: Funding represented the most significant risk. This DDF project achieved many outstanding successes, despite reduced funding and the resulting descoping of the safety element. It took visionary steps, and we made efficient use of government resources. In fact, all the re-scoped objectives were completed at a zero cost for materials and a labor figure of only 0.7 FTE total. Up to $15,000 was authorized for FY 2005 funding of materials, yet no money was taken or otherwise spent on this endeavor this fiscal year—an accomplishment unto itself.